large prostheses with large quantities of ceramic and metal, which may reduce the risk of veneer and framework fracture.[5] In addition, it is easier to achieve passive sitting with non-splinted multiple screw-retained units that reduce static preload forces on implants, and single-unit implants are easier to repair than splinted units.[2]

However, as presented in this case report, when presented with less than ideal implant fixture placement, splinting implant fixtures with a rigid FPD may improve the resistance to forces and alter the center of rotation of the joined units. Among the indications reviewed in introduction, 1) narrow implants, 2) crown-to-implant ratios >1:1, and 3) angled implants were found in the present case. It should also be noted that the implant fixtures in this case were not splinted because of bone loss around #20, as a compromised implant with bone loss it not an indication for splinting.

Conclusion

The utility of splinting implant fixtures is not conclusively established. The following three concepts must be kept in mind when considering splinting implant fixtures:

1. Implant restorations should not be splinted under the assumption that “since it worked on nature dentition, it must work on implants,” since the bio-mechanics are different.

2. Whenever possible, do not splint implant restorations for a) ease of cleaning, b) minimize bulkiness of porcelain reducing chance of fracture, c) ease of repair, and d) ease of passive sitting reducing static preload forces on implants.

3. However, when implant fixtures are not ideally placed, including a) short or narrow implants, b) crown-to-implant ratios greater than 1:1, c) angled implants, d) high loading forces, and e) need for immediate function, then splinting of implant restoration may be indicated to improve the resistance to forces and alter the center of rotation of the joined units.

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Management of a Full-Arch Complex Case Transferred Without Adequate Treatment Plan and Sequence: A Clinical Report

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Abstract
Patient data collection, appropriate diagnosis and treatment planning are critical factors in treating complex patients. In the case presented here, the initial treatment plan did not meet the patient's functional needs and caused confusion about possible oral health outcomes. Thorough new data collection and documentation, including articulated study models, resulted in a diagnosis and treatment plan that addressed the clinical findings and the patient's expectations.

Introduction
This report describes the restoration of a fully edentulous maxilla with progressively complex prosthesis designs and repeated procedural adjustments to accommodate a patient's changing expectations and improve satisfaction.

An extensive amount of research has been conducted on implants and edentulous rehabilitation; almost all include a consistent and fully executed treatment plan.[1] Insightful forethought allows the dentist to guide surgical planning for the best restorative outcomes and allows the patient to receive the best esthetic results of their prostheses throughout the entire course of treatment.[2] The importance of consistent and complete documentation of treatment planning and sequencing cannot be overemphasized. The importance grows exponentially when dealing with a complex case that involves loss of anatomic landmark and irreversible surgical procedures.
Before a treatment plan and sequence of care can be determined, accurate data collection must be performed. Important variables include correct the patient's emotional concerns, motivators, dental IQ, House's classification, and financial resources. A thorough history will minimize the potential for change in patient expectations and demands during completion of the treatment plan. Once the examination is complete, the diagnosis, etiology, the treatment plan, sequence, and the patient's signed agreement to the plan must be documented. In this clinical report, we also describe the utility of an "appointment work schedule" for managing a complex case.

Clinical Report
The patient's chief complaint on initial presentation was that "my bridge is loose". Examination revealed a FPD from teeth #6-11, with #6, 10, and 11 as abutment teeth (Figure 1, 2). The FPD was depressible and #6, 10, and 11 were diagnosed as "hopeless" and treatment planned for extraction. #15 was restorable with a "guarded" prognosis but this was not helpful to overall restoration plan. Extraction and immediate delivery of interim CD was agreed upon by the treating dental student and the patient, however, an alternative final restoration plan was not discussed; the patient's expected that the immediate CD would be her final restoration.

Figure 1 *Initial presentation; panoramic radiograph*

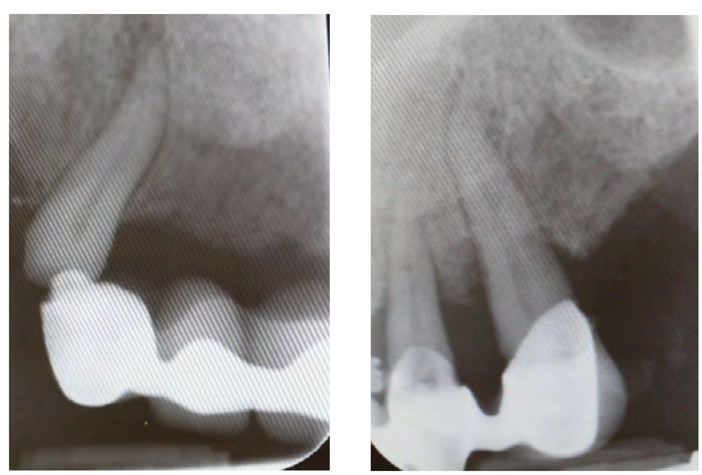

Figure 2 *Initial Presentation; periapical radiographs*

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An immediate CD was delivered following extraction of #6, 10, 11, and 15 (Figure 3). Soon after, the patient complained that the palatal aspect of the denture was over-extended. The palatal area was reduced but the patient was not satisfied.

Since the patient was not satisfied with the fit and comfort of the immediate CD, the student dentist propose a metal reinforced overdenture supported by 4 implants. Four 3i implant fixtures were placed on sites #4, 6, 11, and 14. Upon follow-up examination, the implant on #11 was thought to be failing and a “relief implant” was placed on site #12. However, both #11 and 12 were successfully osseointegrated at a later follow up.

At the latter visit, the patient complained of “inability to sleep edentulous” and stated that that she didn't want to remove her prosthesis at night. The treatment plan was modified again to a fixed restoration. Two additional implants were placed at #5 and 13, making a total of 7 implant fixtures (Figure 3). Implants could not be placed further posterior due to the limitation of severely pneumatized sinuses; use of a surgical guide to dictate fixture placement was not documented.

Clinical Procedure

At the time of transfer of care to the authors the patient had 7 implant fixtures, a fractured interim CD and was confused and concerned. A repeat, full diagnostic work-up, including complete documentation of all patient findings, properly mounted and articulated casts, and a full diagnosis with new treatment plan and sequence were executed. The patient was provided with an “appointment work-schedule”, outlining what procedures would be done at each appointment, how many appointments were needed, and the timing of appointments (Figure 4).

A major disadvantage in treating this complex transferred patient was the complete loss of any useful anatomic landmarks. Since the patient’s initial maximal inter-cuspation relationship was not recorded, both the vertical and horizontal relationships between arches was lost. A new CR record and vertical dimension had to be established and the position, depth, and angulations of the existing implant fixtures evaluated. An open tray impression technique was used to fabricate a final cast (Figure 5).

The final cast was fabricated with Silky Rock stone using the vacuum mix method. Because of the large number of implant fixtures, the position, depth, and angulation of implant analogs needed to be precisely correlated with corresponding intraoral fixtures. First, impression copings were placed back on the final cast (Figure 6). A verification

Figure 3 *A total of 7 implants placed on maxillae*

	Procedures	Duration Until Next Visit
Visit 1	TPS 1: Data collection: patient Interview, Max/Mand alginate impression, interocclusal record, and repair broken CD	1 week
Lab	Pour the casts, make Max base plate and wax rim	
Visit 2	TPS 2: Finalize and sign TP. Using Max base plate, take facebow transfer. Discuss alternative options with patient. Take CR record.	1 week
Lab	Mount the casts on articulator. Order implant parts for impression taking, prepare tray.	
Visit 3	Open tray impression of all Max implants.	1 week
Lab	Pour the impression impression with soft tissue and silky rock. Check with faculty. Connect impression copings with dental floos and GC pattern resin material	
Visit 4	Transfer connected impression copings to verify accuracy of final casts fabricated. Select teeth shade for provisionals. Modify base plate made previously, and use it to establish correct vertical	3 weeks
Lab	Mount Max final cast using new CR record at correct vertical. Send the articulated casts to lab to fabricate denture base + teeth set-up to establish dimensional record	
Visit 5	Try-in "fixed" denture base + teeth set-up. Adjust teeth set-up to correct lip support, buccal corridor, canine guidance, and esthetics.	3 weeks
Lab	Send dimentional record to lab to fabricate custom abutments, fixed provisionals, and metal framework	
Visit 6	Seat custom abutments, try-in metal framework, verify with radiographs. Adjust and deliver fixed FPD provisional	4 weeks
Lab		
Visit 7	Evaluate how patient functions with fixed FPD provisional. Make adjustment to provisional FPD. Take alginate impression as dimentional record. Pick up metal framework with impression. Take new interocclusal record as needed.	3 weeks
Lab	Send the pick up impression out to lab for porclain overlay	
Visit 8	Deliver the final prosthesis with Temp Bond after adjustment	1 week
Visit 9	Follow-up. Take impression for Nightguard	2 weeks
Lab	Send out lab case for nightguard	
Visit 10	Deliver nightguard and put patient on recall, and on Featherstone protocp;	Total duration of treatment = 19-22 weeks

Figure 4 *Appointment work-schedule shared with the patient.*

Figure 5 *Final impression with polyether impression material (Impregum) and G-mask soft tissue shroud*

jig was fabricated with dental floss and GC pattern resin to confirm the master cast. Connected impression copings were transferred to the patient's mouth to verify passive sitting and positioning (Figure 7a, 7b).

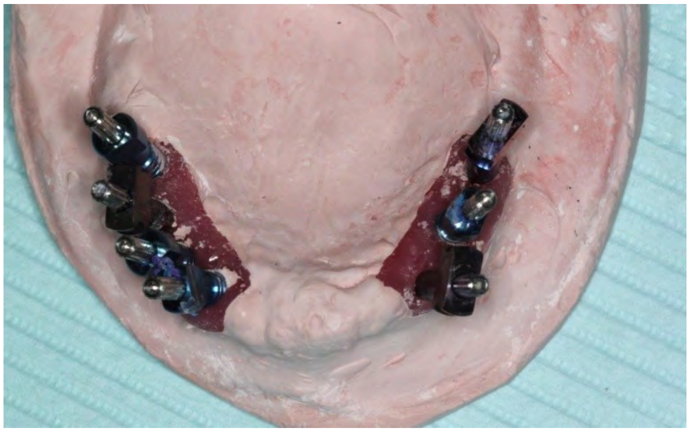
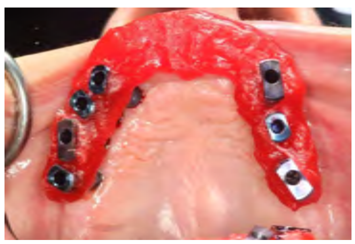


Figure 6 *Final cast with impression copings*



Figures 7a-b *Impression copings were connected on the final cast and then transferred to the patient's fixtures to verify the accuracy of the analog position, depth, and orientation on the final cast*

In order to mount the final cast and opposing cast on the articulator, an "open faced" base plate was fabricated (Figure 8). Adequate vertical space was established using phonetics testing. The patient's CR position was next recorded using Dawson's bimanual manipulation and then verified with Anderson and Tanner's chin point guidance technique.[3] An interocclusal record was taken with Blu-mousse registration material and the lower cast was mounted on a Panadent articulator using facebow transfer.

Figure 8 *"Open-faced" based plate for mounting*

Although the treatment plan was for a fixed final restoration, a removable denture base with teeth was fabricated to establish the general position of the teeth and the arch dimension. This information was used to create a dimensional jig to fabricate the fixed provisional prosthesis. The mounted casts were sent to the lab to fabricate a base plate and teeth set-up. The lab was instructed to incorporate two fixed provisional abutments into the base plate for accurate positioning and to not change the mounted relationship of the casts (Figure 9).

Figure 9 *Base plate with wax teeth set-up, with 2 fixed provisional abutment for accurate positioning; necessary to create a dimensional jig prior to fabrication of fixed prosthesis since no dimensional information of maxillary dentition was recorded prior to extraction*

Teeth set-up in wax was modified intra-orally to establish proper lip support, arch-form, mid-line, canine position, lip-line, and buccal corridor space (Figure 10). This provided the proper dimensions for the fixed maxillary prosthesis, instead of relying on the position of mandibular dentition alone. A canine-guided posterior disclusion was selected as the occlusion scheme for the final restoration.

Figure 10 *Base-plate with teeth set-up is adjusted intra-orally to establish correct dimension of maxillary prosthesis prior to fabrication of fixed FPD provisional prosthesis.*

The next lab prescription was to fabricate 1) angled custom abutments for each implant fixture, 2) splinted full-arch FPD metal framework, with metal occlusal stop for maintenance of vertical dimension, in noble metal for cement-retained restoration, and 3) full-arch acrylic provisional FPD with lingual metal support.

Unfortunately, the case could not be completed by the second treating dental student. At subsequent visits the full seating of the individual custom abutments and accompanying metal framework for the full-arch FPD metal framework will be verified. An all-acrylic provisional FPD will be delivered on the custom abutments as a temporary prosthesis as the vertical dimension, canine-guide posterior disclusion occlusion scheme, phonetics, and esthetics are evaluated. Next, a final pick-up impression of the metal framework, with impression of the adjusted fixed provisional FPD will be sent to the lab to fabricate the final ceramic-metal restoration.

Discussion

The complexity of this case resulted primarily from the multiple modifications in treatment from the first partially formulated and documented treatment plan. Replacing a patient's dentition with a removable restoration may often fail to gain patient acceptance. Implant supported restorations require careful treatment planning in order to deliver a functional and esthetic prosthesis. Initial failure to accurately determine the patient's expectations is likely to lead to difficulties in reaching an acceptable result. Assessing a patient's emotional concerns and motivators for dental treatment, including House's classification of patient attitudes (philosophical, indifferent, exacting, hysterical, etc.) can help the dentist to meet patients' expectations. This is particularly important with complex treatment plans that span more than a year.[4] When restoring a fully edentulous maxilla, the dental arch form, ridge form, palatal vault shape and size, soft-hard tissue relationship, palatal sensitivity, muscle tone and control, tongue position and size1 must all be taken into consideration during treatment planning. The palatal throat form, or the relationship between the soft palate and the hard palate, as classified by House can be broken down into three subdivisions to determine the outcome. In complex cases, evaluating either the palatal throat form or the palatal sensitivity of the patient will influence the planning of the case.[1] Another component of treatment planning in a complex case that should be considered is establishing an "appointment work schedule." The work schedule provides an overall timeline for completion of the treatment including a step-by-step description of what will occur at each appointment, the total number of appointments, and the time between appointments. The schedule helps the dental student to prepare for each appointment. The schedule helps the patient to be an active participant in their care, and to understand how missed appointments can negatively impact both the duration and quality of care.

Conclusion

Using the clinical verification techniques described above, a revised treatment plan was developed, a detailed "appointment work schedule" generated, and a complex case was successfully managed. This case report illustrates the importance of careful, patient sensitive treatment planning and sequencing to meet patient expectations and provide the highest possible level of care.

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Mandibular Ameloblastoma Resection with Fibular Reconstruction and Osseoimplants

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Abstract

An ameloblastoma is a rare lesion that can be encountered in the posterior mandible. This neoplasm is often described in literature as “benign, but locally aggressive,” thus surgical excision is usually required due to possible expansion of the lesion, which may interfere with surrounding structures such as teeth and soft tissue. More serious problems can arise if the ameloblastoma invades into other regions such as the lateral pharyngeal space if the tumor traveled medially or into the intracranial space through the temporal fossa if the tumor traveled superiorly in the mandible. Furthermore, the tumor can have malignant potential and inherently metastatic potential.

In the following case, reconstructive surgery with a free fibula graft was performed immediately following segmental resection of a cystic ameloblastoma tumor in the left posterior mandible. After a period of healing, implants were placed to return the patient’s dentition to full function.

Introduction

There are many tumors and cysts involving the posterior mandible that characteristically appear as a circular radiolucency on radiographs; they include myxomas, hemangiomas, central giant cell granulomas, radicular cysts, keratocystic odontogenic tumors, and last but not least, ameloblastomas. They are the second most common odontogenic tumor in North America behind odontomas.[1] Ameloblastoma derives its name from the fact that its cells histologically resemble ameloblasts, and is possibly derived from these cells of the enamel organ.[2] There is currently no clear cause of ameloblastoma, but several causative factors have been proposed, including nonspecific irritating factors such as extraction, caries, trauma, infection, inflammation or tooth eruption, nutritional deficit disorders, and viral pathogenesis.[3] This tumor does not appear to have any gender predilection and has peak incidence from the 3rd to 5th decades of life.[4] It is five times more commonly seen in the mandible than the maxilla; a large percentage of mandibular cases occur in the posterior area near the molars and along the angle and ramus.[5] The most common symptom is a hard swelling near the site of pathology, although there commonly are no signs or symptoms because they grow slowly; these lesions may only be discovered after a routine dental radiograph.

The ideal treatment for an ameloblastoma is one that minimizes recurrence, decreases damage to donor site, and restores function and appearance of the jaw and teeth. Thus, due to its potential for local destruction and recurrence, radical surgical therapy such as resection of the mandible may be indicated. Once a portion of the mandible is resected, a graft must be placed to replace the missing section of the jaw; one option is a free fibula autograft. Once the graft is placed and healing occurs, including osseointegration and vascularization of the newly constructed mandible, implants can be placed to complete dental rehabilitation.

Case Report

A 20-year-old Caucasian female patient presented to the Weill Cornell Oral & Maxillofacial Surgery and Dentistry clinic with a history of left-sided mandibular ameloblastoma of the posterior body and ramus. The patient had no symptoms related to the mass at presentation. Her general dentist found the lesion after a routine radiograph and referred her to an oral and maxillofacial surgeon. Upon examination of a panoramic radiograph and CT scan, a 2.0 x 1.7 x 1.9cm multilocular cystic lesion was noted between teeth #18 and #17 with thinning of the inner cortex. The lesion was expansile and posteriorly displaced tooth #17, and the radiolucency extended up along the ascending ramus. Anteriorly, the lesion was less defined as it extended along the inferior aspect of the roots of tooth #18 and tooth #19 (Figure 1). Clinical oral evaluation revealed fullness of the left posterior mandible and ramus consistent with a jaw tumor. She had minimal pain to palpation and sensation in the mental region was normal, indicating that the inferior alveolar nerve was most likely not affected.

Figure 1 *Radiograph taken at initial visit*

The treatment plan included left segmental mandibuloectomy with reconstruction using a right fibula osteocutaneous free flap graft. The fibular and mandibular osteotomies were planned using Medical Modeling imaging software (Figures 2, 3). During the surgical procedure, fibular osteotomies were made approximately 6cm proximal to the lateral malleolus and 6cm distal to the articulation of the fibula with the knee using pre-fabricated fibula cutting guides. The bone graft along with peroneal vessels and skin paddle were harvested to replace the affected mandibular component. After extraction of tooth #17, a 2.3mm pre-bent titanium plate was adapted over the lesion from the left mandibular body to the posterior ramus using bicortical nonlocking screws, and the bony lesion was resected using a pre-made osteotomy guide. Maxillo-manidbular fixation (MMF) of the remnant mandible with the maxilla was accomplished using MMF screws and elastic bands. The free fibula flap was then secured onto the titanium plate with five bicortical locking screws, and the reconstruction plate with fibula flap were secured onto the pre-drilled mandible. The inferior border of the fibula flap graft was intentionally placed about 5mm higher than the inferior border of the native mandible to compensate for height difference. Then, microanastomoses were created by suturing the peroneal artery to the facial artery, and coupling the larger of the peroneal veins with the facial vein.

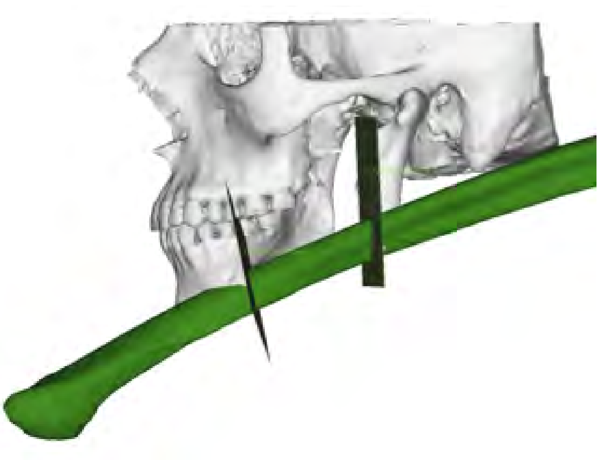

Figure 2 *Planning of fibula graft*

Figure 3 *Final graft*

After 18 months of non-incidental healing, the patient presented for an implant consult to replace teeth #18 and #19. Two 3i 4.0 x 11.5mm implants were placed in the area of the left reconstructed mandible (Figure 4). After healing abutments were placed, the patient eventually received a 3-unit fixed prosthesis for the implants.

Figure 4 *Post-#18 and #19 implant placement*

Discussion

Appropriate treatment modalities for ameloblastoma are controversial in that a conservative approach may be favored, understandably, versus a more radical one. The conservative approach includes enucleation and curettage. Enucleation involves separating the lesion from the bone, with preservation of bone, taking advantage of the fact that the lesion is encapsulated within a connective tissue envelope that is derived from the lesion or surrounding bone. Similarly, curettage is removal of the lesion, with preservation of bone, by directly scraping away the lesion from the bone with absence of any encapsulating connective tissue derived from the lesion or surrounding bone. The so-called radical approach includes resection where a portion of bone surrounding the lesion is excised in addition to the lesion itself. Segmental resection is removal of a portion of bone with continuity defect; in other words, the piece of bone that is excised discontinues a length of bone leaving free edges of bone on either end. Marginal resection is removal of bone without continuity defect; there is no complete disconnection of bone. Segmental resection should be performed when there is thinning of the inferior or posterior border of the mandible, as was described in this case.[7]

In a study of Sehdev et al, a total of 92 patients were reviewed: 72 patients with mandibular tumors and 20 patients with maxillary tumors. 100% of the maxillary tumors and 90% of the mandibular tumors that were conservatively treated by curettage recurred. In fact, 9 out of the 92 patients died as a result of complications related to recurrence of the ameloblastoma lesion.[8] Radical mandibular surgery, on the other hand, was associated with only an 8.7% recurrence rate.[9] For a small lesion, simple enucleation and curettage may be adequate, but for larger neoplasms, such as this case, the benefits of resection outweigh the risks. With extensive lesions, if bone were attempted to be preserved by modest treatment, only a small amount of marginal bone would remain increasing risk for fracture.[10] Therefore, a segmental resection was planned as opposed to a marginal mandibulectomy. Despite high recurrence rates, some surgeons still advocate a conservative approach, especially for young patients in whom growth and development is still occurring and for elderly patients to avoid surgical complications.[9]

When determining treatment approach for any pathological disease, conservative treatment is generally more desirable, but in the case of ameloblastoma, simple enucleation and curettage procedures can lead to higher recurrence rates of the tumor and possible malignant development, in contrast to a more radical approach such as segmental mandibulectomy.[3] Especially in a young, healthy patient such at the one presented in this case, drastic therapy can be considered to prevent recurrence and ensure full removal of affected bone and tissue. Consequently, lateral segmental mandibulectomy followed by reconstruction using a free fibula flap was the treatment of choice in this case. Especially with the tumor invading into the 1st and 2nd molars and ramus, the anterior dentition and posterior jaw were being compromised at the expense of the ameloblastoma, warranting complete removal of the section of afflicted mandible.

Ameloblastomas tend to infiltrate trabeculae of the cancellous bone on the lesion’s periphery before bone resorption may become apparent radiographically. This means that if one attempted to remove the tumor via enucleation or curettage using the visible tumor margin as a guide, some neoplastic cells may be left behind leading to recurrence. Unfortunately, most ameloblastoma lesions originate centrally, as opposed to peripherally, thus surgery requires bony invasion resulting in deformation of normal structure. In mandibular tumors, the end result is frequently loss of the continuity of the mandible, necessitating reconstructive techniques.[12] Once the mandible has been segmented, immediate reconstruction with a graft is important because “dead space” can accumulate fluids that may cause infection; also, the space can contract leading to functional and esthetic issues. There is less infection, scarring, contraction, and morbidity with immediate reconstruction.

The free fibula flap was first utilized for mandibular reconstruction in 1989 by David A. Hidalgo, M.D., and is a graft of choice for jaw reconstruction along with the iliac flap. The fibula flap is widely accepted for reconstruction of mandibular defects because of its adequate length and amenability to dental implants. [14]

After the graft is placed and healed, dental rehabilitation is the next and final step in returning the patient back to optimal function and esthetics. Without any dental rehabilitation, such as a fixed prosthesis or a removable partial denture, noticeable mandibular asymmetries may be seen and decrease patient satisfaction.[6] Resorption rates tend to be greater with grafts, so implants are a better option than RPDs.[14] The recommended time for implant placement into healed grafts is at least 4-8 months after surgery. There are instances where implants are placed at the time of the initial resection and reconstruction surgery; however, immediate implants are still a novel idea that requires further research.[14] Another benefit of the fibula flap is that the quality of the bone is more cortical than the ileum, which provides a better foundation for dental implant anchorage.

Conclusion

Segmental resection of the mandible is currently the treatment of choice for large cystic ameloblastomas with little surrounding bone, as demonstrated in this case. Ideally, one would not prefer to remove an entire section of natural bone, but there are multiple considerations that require elective resection of the mandible, as discussed in this article. For smaller lesions, curettage and enucleation, cryotherapy, or marginal resection could be sufficient to eradicate the ameloblastoma and reduce chance for future recurrence.

In the future, non-surgical approaches may be plausible; for example, one recent research study conducted by Sauk et. al demonstrated that specific SHH signaling molecules and the PI3K/Akt/mTOR pathway are involved in ameloblastoma cell proliferation. The goal is for chemotherapy to target such pathways to eliminate the disease without surgical intervention.[12]

The main objective after resection and reconstruction of the mandible is to restore the patient’s jaw function and appearance. With the use of grafts and implants, it is possible to restore the patient’s oral and maxillofacial health and improve the patient’s quality of life.

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Placement of Glass Ionomer as an Interproximal Sealant: A Case Report

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Abstract

Dental caries is reported to be the most common chronic childhood disease worldwide.[1, 7] The World Health Organization considers dental sealants to be the most effective and least invasive primary preventive measure.[2] However, while dental sealants remain a mainstay for pit and fissure caries prevention, there have been no similar advances for smooth surface (interproximal) caries prevention, which account for approximately 58.8 to 77.5% of the total caries burden.[14, 15, 16] The objective of this case report is to present a non-invasive technique that enhances clinical access and prevents caries formation on a vulnerable interproximal tooth surface through sealant application.

Introduction

Dental caries remains the most common chronic disease that is neither self-limited nor treatable by antibiotics.[1] Worldwide, 60-90% of school children and nearly 100% of adults have been diagnosed with caries.[2] While data extrapolated from the 1991 NHANES study and the U.S. Census Bureau Report have reported increases in preventative procedures and an overall decrease in dental caries among adolescents, the disease remains prevalent. Moreover, for children aged 2-5 years, dental caries in primary teeth is on the rise.[4]

Dental researchers and the dental industry have strived to find practical, non-invasive means for both caries prevention and treatment. Today, dental sealants are considered the primary preventive and least invasive measure for pit and fissure caries prevention.[6, 7] Sealants create a protective barrier from microorganisms found within bacterial biofilm.[8] While this benefits mainly occlusal pits and fissures, there is no direct interproximal preventative effect, even though such smooth-surface lesions account for approximately 28-48% of caries in children on average across different ethnic backgrounds.[14, 15]

Recently, a resin infiltration system was introduced that offers a micro-invasive alternative to treat non-cavitated proximal lesions.[3, 9] This technique is based on the use of capillary force to transport a high-viscosity resin with higher penetration coefficient into enamel microstructure.[3] The multi-step technique involves plastic strip isolation, selected surface etching (15% hydrochloric acid) for 2 minutes, rinse and dry, 95% ethanol and air-drying, resin infiltration with syringe, polymerization, and infiltrant re-application and polymerization.[10] The research determined that, ultimately, infiltration was an effective therapy for early proximal lesions.[10] While this method has been used to treat already formed lesions, its use has not been explored in terms of a preventative alternative (e.g. sealant) to proximal decay.

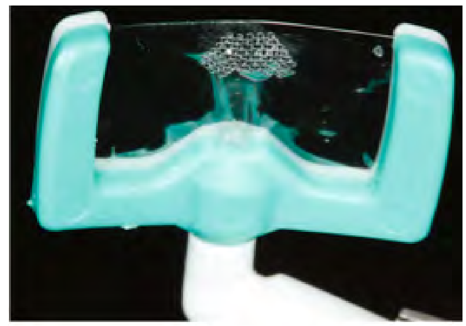

Figure 1 *Icon perforated mesh foil*

In the current study, a novel ICON interproximal perforated mesh foil (Figure 1) was used to deliver a layer of resin-modified glass ionomer (RMGI) protective sealant material onto a vulnerable proximal tooth surface. This method eliminates the multiple steps (etching, infiltrating, etc.) recommended by the Icon system while directly chemically bonding RMGI to the proximal tooth surface. Glass ionomer cements are known for their ability to chemically bind to tooth structure, hydrophilic moisture-tolerant nature, and fluoride release.[11] The fluoride ions taken up by the enamel make the tooth less susceptible to the bacterial acid challenge and facilitates remineralization.[12] Glass ionomer sealants have been proven particularly effective relative to resin-based sealants, as the latter will fail if incomplete isolation and/or salivary contamination occurs.[12] The aim of this protocol was to evaluate the efficacy of a proximal sealant for the preventative aspect of dental practice and the reduction of a major component of the caries disease burden.

Case Report

Background: This report highlights the potential application of interproximal sealants and is part of an ongoing research protocol (IRB – AAAM2564). A 9-year-old female presented with her mother for comprehensive care to the undergraduate pediatric dentistry clinic. The patient had a history of previously treated caries and poor oral hygeine. Clinical and radiographic examination showed existing caries on the distal surfaces of #J and #K. The mesial surface of #19 remained intact with no signs of incipient lesions.

Given the patient's history and present clinical findings, she was assessed as high caries risk. Research has shown that proximal caries in contact with a healthy adjacent tooth surfaces increases one's risk of developing new caries.[13] Therefore, the patient could significantly benefit from interproximal sealant placement particularly to protect the mesial surface of erupted permanent molar #19. Patient and parental consent were obtained to participate in this case report.

Figure 2 *Sealant discharge from the Icon perforated mesh foil*

Figure 3 *Separator placed between the teeth*

Figure 4 *Placement of sealant using ICON technology and resin modified glass ionomer*

Procedure: After completion of a full clinical exam, intact yet vulnerable proximal surfaces were noted. Once the proximal site was identified, the spacing available was evaluated. An orthodontic elastic separator was placed between teeth K and #19 (Figure 3) to allow for adequate space maintenance in the interim period between appointments. At the next visit, through cotton roll isolation and utilization of the low-speed suction, the ICON interproximal foil was placed between teeth K and 19 (Figure 4). The DMG ICON infiltration product has been used in previous studies with success.[6] The ICON's unique foil sieve is one-sided, enabling sealant discharge onto the desired surface only (Figure 2).

After adequate isolation, the foil was placed with the sieve facing the mesial of #19. The applicator tube was filled with resin-modified glass ionomer and was then pushed through the sieve (Figure 2). Unlike conventional resin-based sealant material, glass ionomer is moisture-friendly and fluoride releasing. The steps needed for resin-based sealants such as acid etching, application of primer, or bonding agent are not required. Once placed, the glass ionomer sealant infiltrate was held in place for 2-3 minutes for an initial set. The patient was then asked to gently bite on a cotton roll for another 3-4 minutes until completion of the setting reaction.

Clinically, the sealant was present and contoured to the mesial surface of #19 (Figure 5). Excess cement was removed and the patient was discharged with no complications and routine oral hygiene maintenance instructions were given.

Figure 5 *Clinical presence of GI interproximal sealant*

Discussion

Comprising approximately 39% of childhood decay by age 12, interproximal caries make up a significant part of a chronic disease burden afflicting children worldwide.[3] Upon placement of a glass ionomer interproximal sealant via ICON technology, the sealant remained intact clinically. On the patient's next routine dental visit (6-12 months), new bitewing radiographs will be taken to assess whether the glass ionomer is still present interproximally. Glass ionomer material has numerous advantages in terms of moisture tolerability, chemical bonding, and fluoride release. Thus, use of such a material as an interproximal sealant could have important implications for tooth protection and caries prevention. Continued presence of the sealant will show that the glass ionomer is as effective as the more common ICON multistep infiltrate system in preventing caries in that region.

This protocol is an ongoing investigation; the relative value of glass ionomer interproximal sealants will be better evaluated upon application to a greater sample size, initial radiographic data (6-12 months), and statistical analysis have been completed. From the current case study, researchers have noted that future application should involve use of a radiopaque glass ionomer cement so that radiographic analysis can be adequately assessed.

Conclusion

Injecting RMGI through the ICON's proximal, perforated mesh foil, a glass ionomer sealant placed interproximally has significant potential, allowing for possible smooth surface caries prevention. This technique warrants further investigation.

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Treatment of Dental Sequelae in Childhood Cancer Survivors: A Case Report

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Abstract

Dental considerations for survivors of pediatric cancer therapy can be significant due to changes induced by treatment, which may include surgery, radiotherapy, and combination chemotherapy. Patients are at greater risk for developmental changes in the oral cavity, especially when exposed at a younger age. Changes can include dental agenesis, microdontia, incomplete enamel calcification, and salivary changes.

Introduction

Treatment of childhood cancer has vastly improved due to successes in surgery, radiotherapy, and combination chemotherapy.[1] Overall survival rate of patients treated with childhood cancer is now in the range of 80 to 90%.[2,4] However, treatment with radiation and chemotherapy can have lasting damage, especially when administered to the pediatric patient during a time of development. Severity of dental complications depends on tumor diagnosis, length and type of therapy exposure, and age of treatment.[2] Possible dental changes include agenesis, microdontia, dental hypoplasia, and hypocalcification.[3] In addition, patients may experience salivary changes such as xerostomia, which may predispose them to dental caries and periodontal disease.[1]

In the case presented, the patient was diagnosed with anaplastic ependymoma at age 2. This is the third most common brain tumor found in children, representing about 6-10% of childhood brain tumors.[5, 6] Anaplastic ependymomas have poor prognosis compared to classical ependymomas.[6] This tumor is especially difficult to treat in pediatric patients due to its location, which predominantly arises from the fourth ventricle. Surgical removal is the most important prognostic factor but complete resection can be challenging.[5] Other limitations include use of radiation therapy and chemotherapy due to potentially irreversible changes it can have in pediatric patients, such as functional impairment of the developing brain.[6]

Case report

A 9-year-old male presented with his guardian to the Columbia Pediatric Dental Clinic for a recall examination. His medical history was significant for an anaplastic ependymoma located on the left parietal-occipital lobe, which was diagnosed at age 2.5. He was treated with resection and chemotherapy later that year, in July 2005. The patient received autologous stem rescue in 2006. Local recurrence was discovered in 2007 and treated with resection. At this time, the patient was treated with radiation and completed therapy in May 2007.

Presently, the patient has incomplete hearing loss and requires bilateral hearing aids. He is currently cancer free and has no other medical problems. Along with routine examination, prophylaxis, and fluoride treatment, a panoramic radiograph was taken and revealed blunted roots, agenesis of multiple teeth, and microdonts (Figure 1). Tooth #2, #4, #13, #15, and #18 were absent and tooth #20, #29, and #31 were microdonts. Exfoliation of tooth #K and #T were impeded due to only partial resorption of the mesial roots by tooth #20 and #29, respectively (Figures 2,3). It was recommended that tooth #K and #T be extracted.

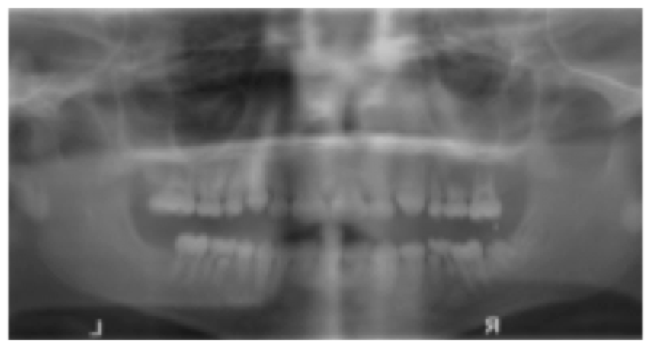

Figure 1 *Panoramic radiograph taken at initial visit*

After the first visit, the patient presented for two follow-up visits for the extractions. After obtaining adequate anesthesia, tooth #K and #T were extracted with no complications.

The patient was then referred to the Columbia Orthodontic Dental Clinic for evaluation. Presently, orthodontic treatment for this patient is not feasible due to stunted root development. Therefore, a possible treatment alternative includes fabricating a space maintainer to allow for full eruption of tooth #20 and #21 without mesial tipping of tooth #19 and #30, followed by prosthetic treatment of tooth #20 and #21 to build up the size of their crowns. The treatment plan for the agenesis of tooth #4 and #13 involves the retention of their primary tooth predecessors. It is possible that in the future tooth #A and #J may require extraction with placement of implants. However, the patient's history of radiation therapy would need to be considered for the placement and prognosis of the implants.

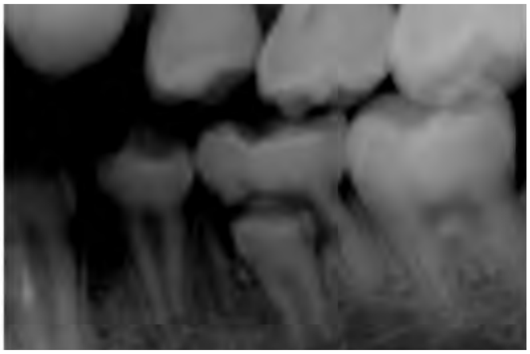

Figure 2 *Periapical radiograph showing mesial root resorption of tooth #K*

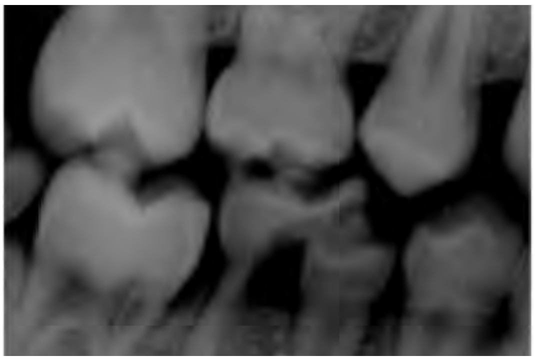

Figure 3 *Periapical radiograph showing mesial root resorption of tooth#7*

Discussion

Dental considerations for survivors of pediatric cancer therapy can be significant and require long- term follow up. The age at which cancer treatment begins plays a significant role. Typically, the younger the patient is, the greater the risk of damage to developing oral structures.[4]

Radiation can damage tooth buds during development, inhibiting processes involved in odotontogenesis and amelogenesis.[1] This can result in dental agenesis, microdontia, dental and enamel hypoplasia, and root stunting. Root stunting can be especially detrimental since dental eruption patters can be affected, possibly causing future loss of the tooth.[4] In addition, patients who exhibit stunted root patterns may not be suitable candidates for orthodontic treatment due to inadequate anchorage.[4]

Microdontia is another common side effect, ranging from 10% after conventional chemotherapy to 78% after stem cell transplantation.[7] Microdontia of premolars and permanent molars occurs most commonly in children exposed to chemotherapy before the age of 3.[8] Exposure during early stages of odontogenesis is strongly correlated to development of microdontia, whereas later exposure results in less damage to the tooth bud.[8]

Patients who have undergone cancer therapy are also at greater caries risk. Radiation to the head and neck can cause lasting damage to the salivary glands. Dosage and extent of involvement effects whether normal function of salivary glands can be regained. When salivary gland function is impaired, an acidic oral environment may develop, promoting colonization of caries-related microflora.[1,3] While chemotherapy can also affect salivary glands during treatment, dryness of the mouth typically lasts for only a short period after completion of treatment.[4]

Conclusion

Management of patients who have received cancer treatment requires unique considerations. Patients who have been treated should have frequent follow-up visits to the dentist in order to receive timely treatment and minimize dental and periodontal disease.

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The case report should be organized in the following manner:

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The abstract summarizes the principal points of the case report and specific conclusions that may have emerged in the discussion. It should be limited to less than 250 words.

Author Information

A description of each author's degrees, titles, department, and affiliation should be given.

Information

The introduction should provide a brief description of the topic, as well as any relevant epidemiology and current opinion as documented in the literature.

Case Report

A description of the case(s), including pertinent photographs.

Discussion

A thorough review of the literature, including other reported cases that are relevant to the case(s) presented or reported.

Conclusion

Based on the present case(s) and the discussion.

References

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